Traffic Impact Study

Wisteria Hills Subdivision
Knox County, Tennessee

September 9, 2005

CCI Project No. 00597-0002

Prepared for:
The Land Resource Group
857 Ebenezer Road
Knoxville, Tennessee 37923

Cannon&Cannon, Inc.
Civil Engineering • Field Surveying

9724 Kingston Pike, Suite 1100 • Knoxville, Tennessee 37922
Tel No. (865) 670-8555 • Fax No. (865) 670-8866

TABLE OF CONTENTS

Figures and Tables

EXECUTIVE SUMMARY

This report summarizes a traffic impact study that was prepared for the proposed Wisteria Hills Subdivision, to be located off Yarnell Road in West Knox County. The project concept plan currently proposes 93 single family lots at full build-out. The study resulted in the conclusions and recommendations discussed below:

It is the primary conclusion of this study that no significant traffic volume related impacts will result from the development of the Wisteria Hills Subdivision. In fact, capacity analyses of proposed side street (2-way) stop traffic control, indicates that excellent traffic operational conditions (LOS "A") can be expected during all time periods. In addition, analyses of the need for auxiliary traffic lanes such as left and right turning lanes, indicates that no such lanes will be warranted under the anticipated traffic conditions.

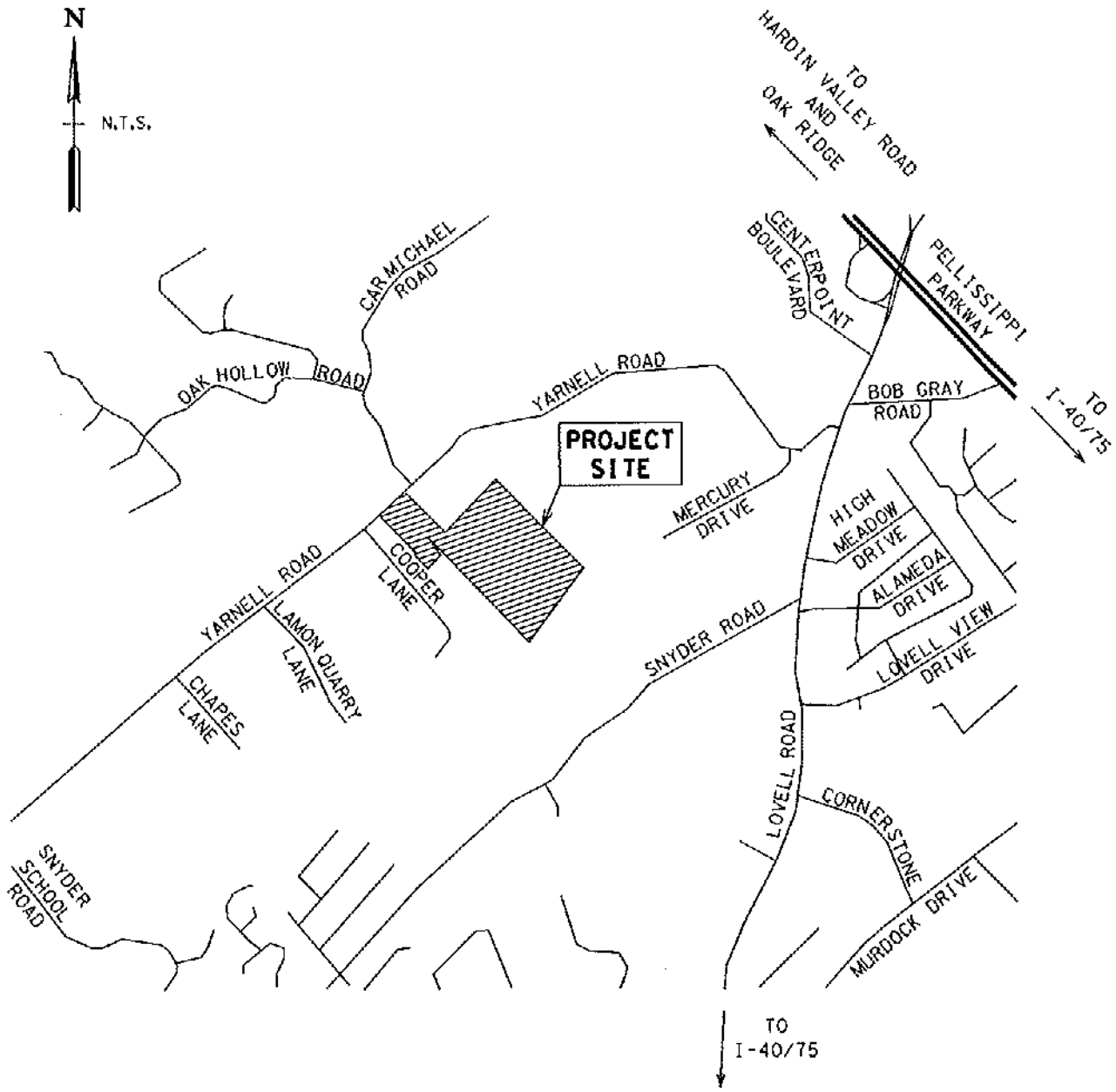
Intersection corner sight distance was also evaluated for the proposed Wisteria Hills Subdivision access roadway intersection with Yarnell Road. Field observations indicated that the proposed intersection is located between two sight limiting vertical hillcrests on Yarnell, one to the east and one to the west. However, it was determined that the intersection can be positioned between the two hillcrests, such that the 400 foot minimum sight distance required for a 40 mph design speed can be achieved (Section 62-88 of the Knoxville-Knox County Subdivision Regulations). In the absence of actual design speed information, the design speed is normally assumed to equal the posted speed limit, which in this case is 40 mph. It is recommended that as a minimum, the subdivision design engineer position the intersection to meet requirements and to equalize the available sight distance in each direction. Minor trimming of existing trees and brush may be required to fully maximize the available sight distance. Therefore, such action is recommended prior to opening the subdivision roadways to traffic.

INTRODUCTION AND PURPOSE OF STUDY

This report provides a summary of the traffic impact study that was performed for the proposed Wisteria Hills Subdivision to be located off Yarnell Road in west Knox County. The project site is approximately ¾ mile west of Lovell Road, and approximately 1 ½ miles south of the Pellissippi Parkway and Hardin Valley Road intersection. FIGURE 1 is a location map that identifies the project site in relation to the roadways in the vicinity of the proposed subdivision.

The concept plan for this project currently proposes a subdivision of 93 single family lots at full build-out. The subdivision entrance will be at a new three-leg intersection on Yarnell Road, located approximately 300 feet west of the existing intersection of Yarnell Road with Carmichael Road, and 400 feet east of the existing intersection of Yarnell Road with Cooper Lane. FIGURE 2 provides a detailed layout of the proposed subdivision as shown on the concept plan.

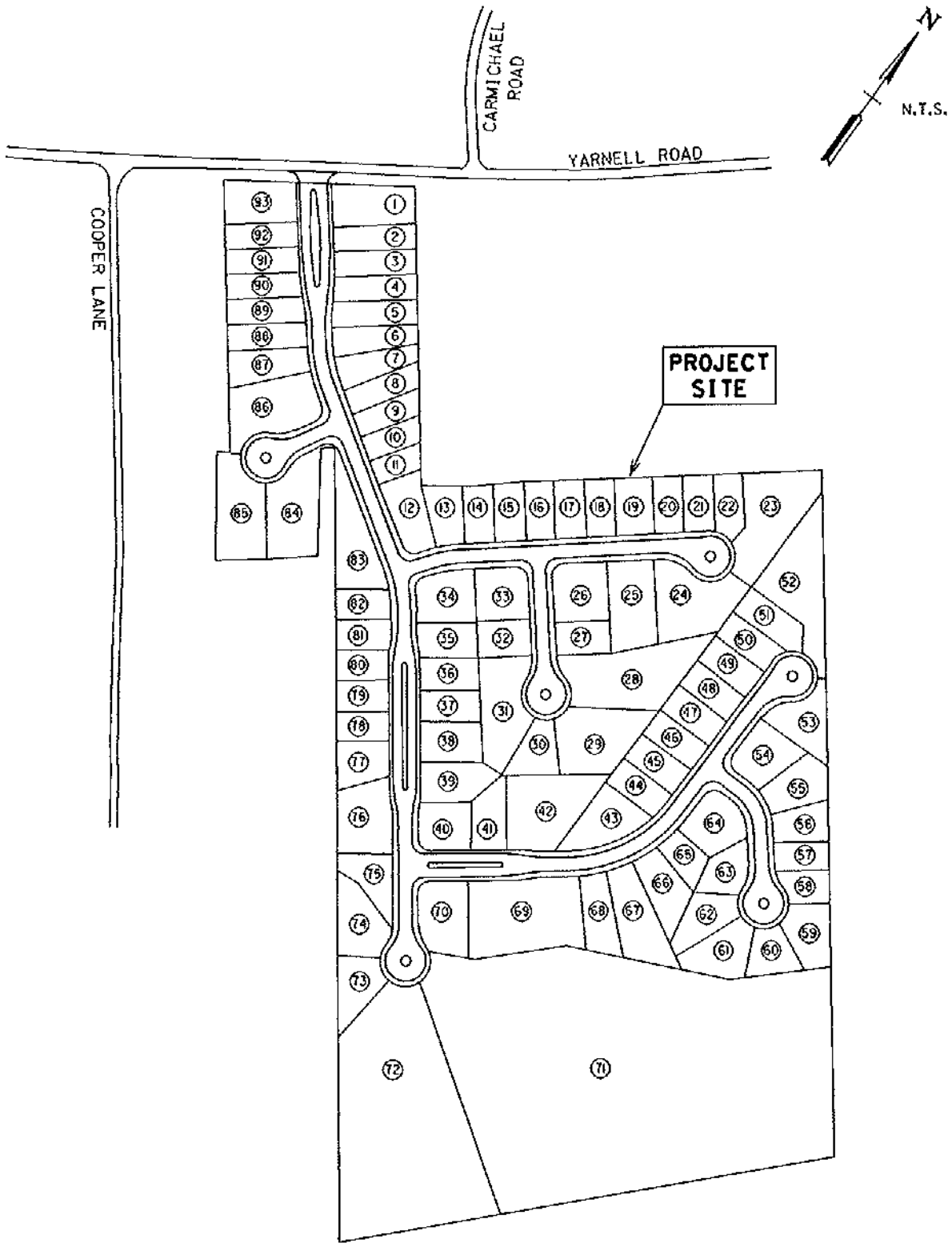
The purpose of this study was the evaluation of the traffic operational and safety impact of the proposed development upon the adjacent portion of Yarnell Road. Of particular interest was the proposed intersection of Yarnell Road with the subdivision main entrance roadway.



Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 1
LOCATION MAP

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY



Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 2
SITE PLAN

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY

Existing Roadway Conditions

Yarnell Road is a two-lane roadway that is classified by the Knoxville-Knox County Metropolitan Planning Commission (MPC) as a Minor Collector roadway. It is located within Knox County, and is thus maintained by the Knox County Department of Engineering and Public Works. The roadway pavement consists of two traffic lanes of approximately ten feet in width, with minimal shoulders. The speed limit is posted as 40 mph.

Existing Traffic Data

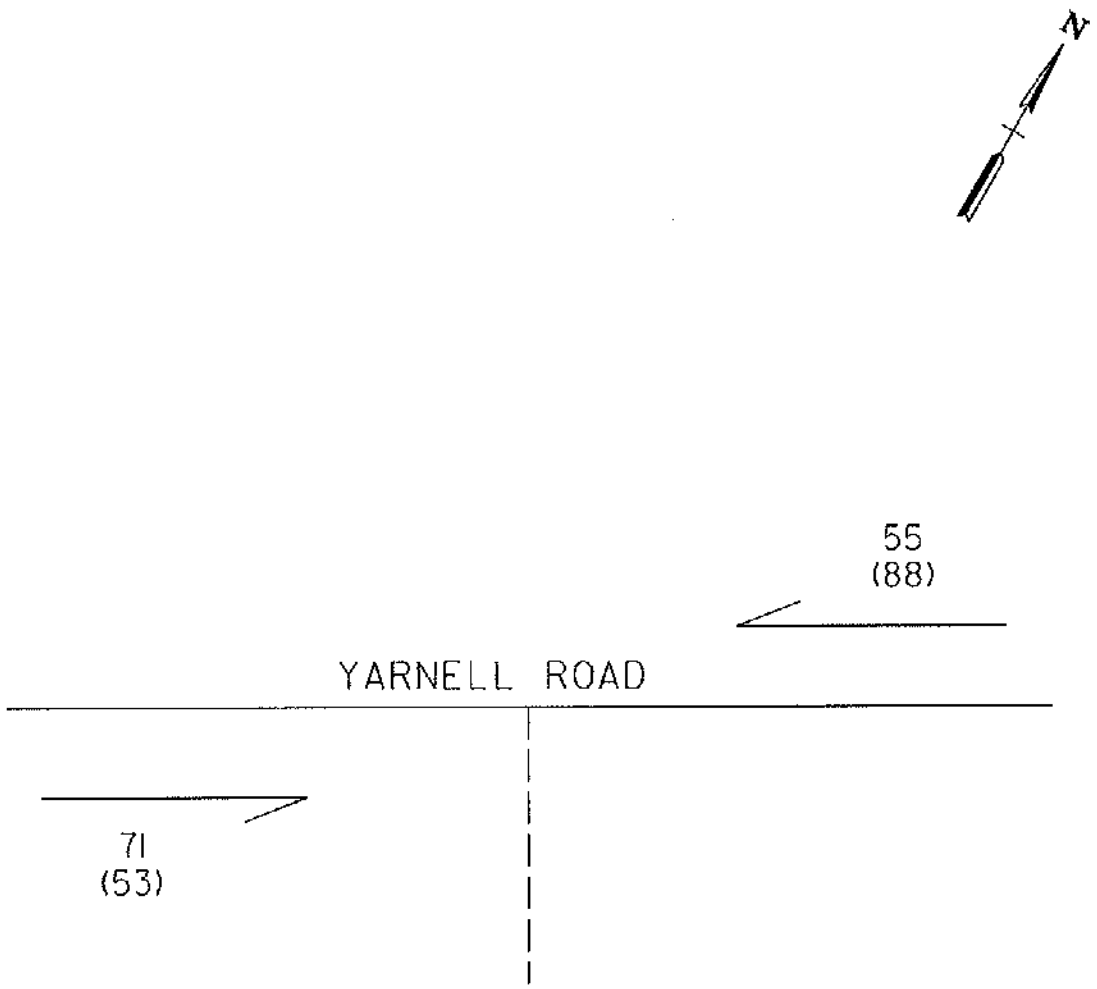
A traffic count station for collecting average daily traffic data (ADT) is located on Yarnell Road, east of Mercury Drive, (count station T134). The most recent data was provided by MPC and is shown in Table 1.

TABLE 1
EXISTING ADT COUNTS
(Station T134)

Year	ADT Estimate
2002	1511
2003	1700
2004	1728

In order to collect more refined data, and to establish a basis for trip distribution patterns, turning movement traffic counts were collected at the intersection of Yarnell Road and Carmichael Road, approximately 300 feet east of the proposed subdivision intersection. These counts were conducted during the A.M. and P.M. peak traffic hours. Raw data summary sheets for these counts are contained in the APPENDIX.

In addition to helping establish trip distribution patterns, these turning movement counts were used to establish the existing-background traffic volumes for this study. Specifically, the west-leg volumes from the counted intersection were used for this, as displayed on FIGURE 3. These volumes are the count data adjusted to an average weekday basis using adjustment factors developed by the University of Tennessee Transportation Research Center.



TOP NO. - A.M. PEAK HOUR (7:15 - 8:15 A.M.) - A.M. AWD FACTOR = 0.98 (THURSDAY IN SEPTEMBER)

(BOTTOM NO.) - P.M. PEAK HOUR (4:15 P.M. - 5:15 P.M.) - P.M. AWD FACTOR = 1.01 (WEDNESDAY IN SEPTEMBER)

NOTE:
THE DATA SHOWN ARE THE RAW TRAFFIC COUNT DATA TIMES A FACTOR TO ADJUST TO AN AVERAGE WEEKDAY VOLUME FROM COUNTS TAKEN IN NOVEMBER. SEE APPENDIX FOR RAW COUNT DATA AND FACTOR TABLE. (FACTORS DEVELOPED BY THE UNIVERSITY OF TENNESSEE TRANSPORTATION RESEARCH CENTER).

Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 3
EXISTING BACKGROUND TRAFFIC DATA

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY

Level of Service Evaluation

Intersection Capacity Analyses employing the methods of the Highway Capacity Manual (HCM 2000) were used to evaluate the proposed study intersection of Yarnell Road and the Wisteria Hills Subdivision access roadway. However, since this intersection will not exist until the subdivision is constructed, such analyses were not possible for existing conditions. It should be noted that due to the low existing traffic volumes, Yarnell Road almost certainly currently operates at a Level of Service "A". Please see the following section for an explanation and discussion of Level of Service concepts.

Level of Service Concepts

In a general sense, a roadway is similar to a pipeline or other material carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Federal Highway Administration has published the Year 2000 Highway Capacity Manual (HCM2000), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

Level of Service (LOS)	General Quality of Traffic Flow	Description of Corresponding Conditions
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

Background Traffic Growth

The anticipated time for full build-out of the Wisteria Hills Subdivision is 3 years, with the project beginning in 2005. Therefore, year 2008 was established as the appropriate design/analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth to year 2008, it was necessary to establish an annual growth rate for existing traffic. Because existing volumes are relatively low in the study area, a fairly high growth rate was considered appropriate in order to provide a conservative assessment. Therefore, a background annual growth rate of six percent was assumed, which is consistent with the growth rates reflected in the Table 1 ADT counts. FIGURE 4 contains the background traffic volumes that would result from a 6.0 percent annual growth from year 2005, when counts were conducted, to year 2008.

Trip Generation

In order to estimate the expected traffic volumes to be generated by full build-out of the proposed Wisteria Hills Subdivision, the data and procedures of *Trip Generation, Seventh Edition* (Institute of Transportation Engineers, 2003) were utilized. The generated traffic volumes were determined based on the total weekday morning, and evening peak hour of adjacent street traffic regression equations for single-family detached housing development (Land Use Code 210, Volume 2, pages 269 to 271). As noted earlier in this report, the anticipated number of units upon full build-out is 93, which was used to determine the number of new trips generated. TABLE 2 summarizes the number and directional split of entering and exiting trips for peak periods for the proposed subdivision.

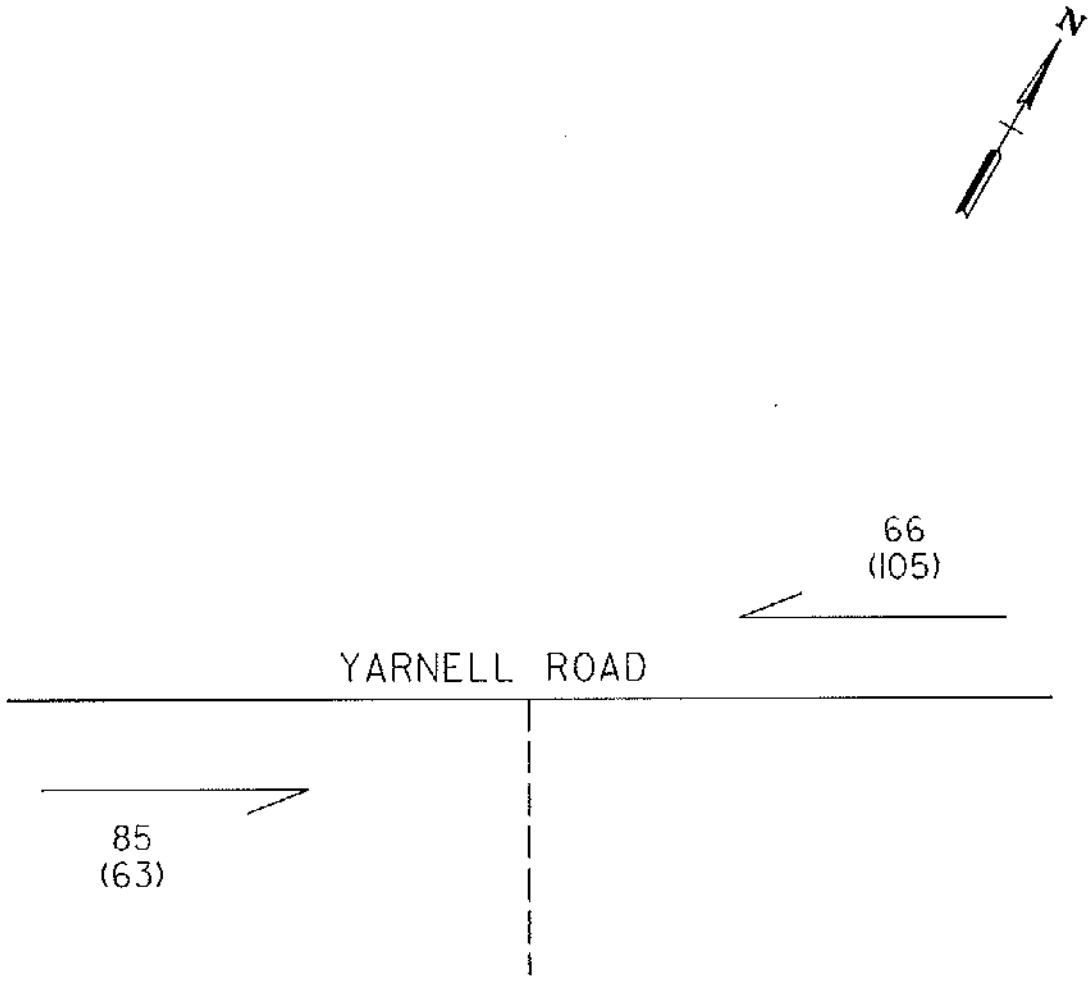
TABLE 2

TRIP GENERATION SUMMARY

WISTERIA HILLS SUBDIVISION – 93 LOTS

SINGLE FAMILY DETACHED HOUSING – I. T. E. LAND USE CODE: 210

	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday	973	50%	50%	487	487
A.M. Peak	75	25%	75%	19	56
P.M. Peak	101	63%	37%	64	37



NOTE:
ANNUAL GROWTH ASSUMED
= SIX PERCENT (6%)

VOLUME
LEGEND
AM
(PM)

Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 4
PEAK HOUR TRAFFIC VOLUMES
BACKGROUND TRAFFIC - YEAR 2008

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY

Trip Distribution

FIGURE 5 provides a summary of the trip generation patterns developed for the proposed subdivision intersection with Yarnell Road, which were based on the existing patterns at the nearby (300 feet east) intersection of Yarnell Road and Carmichael Road. Because these intersections will be in close proximity and along the same roadway, it was assumed that their trip distribution patterns would be very similar. In addition, FIGURE 5 also provides the generated traffic volumes as assigned to the local roadway network in accordance with these patterns. FIGURE 6 shows the combined year 2008 volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from Wisteria Hills Subdivision at full build-out. These are the volumes used in the analysis of full build-out conditions.

YARNELL ROAD

	NO.	%
AM	10	50%
PM	32	50%

	NO.	%
AM	10	50%
PM	32	50%

	NO.	%
AM	28	50%
PM	19	50%

	NO.	%
AM	28	50%
PM	19	50%

WISTERIA HILLS
SUBDIVISION

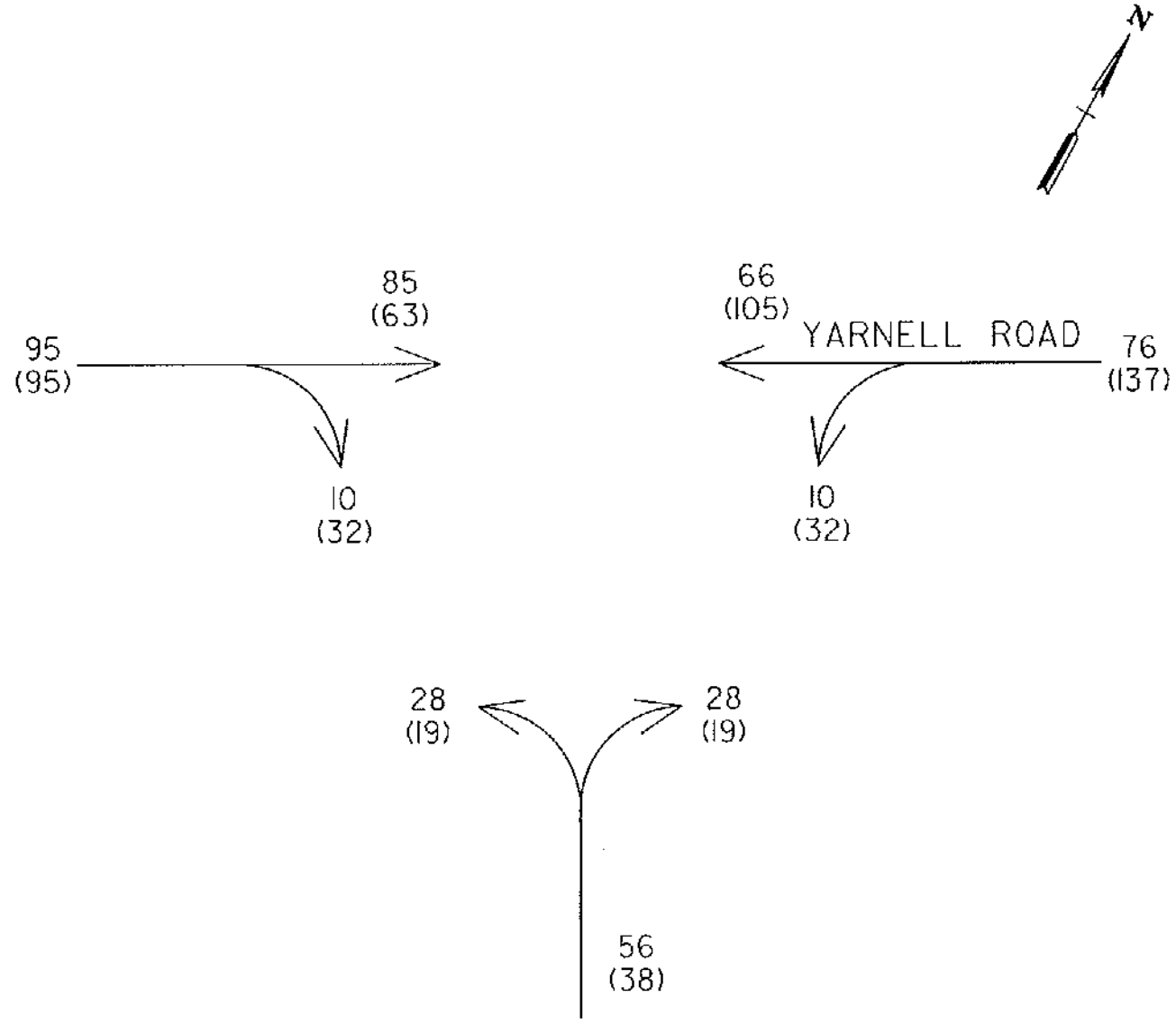
TOTAL GENERATED TRIPS		
	ENTER	EXIT
AM	19	56
PM	64	37

NOTE;
ENTER/EXIT DISTRIBUTION PERCENTAGES ASSUMED BASED ON TRAFFIC COUNTS FROM ADJACENT INTERSECTION OF YARNELL ROAD AND CARMICHAEL ROAD.

Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 5
TRIP DISTRIBUTION PATTERNS AND ASSIGNMENT OF GENERATED TRAFFIC

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY



VOLUME
LEGEND
AM
(PM)

NOTE: VOLUMES SHOWN ARE PROJECTED FULL BUILD-OUT VOLUMES FOR YEAR 2008.

Cannon & Cannon, Inc.
Civil Engineering - Field Surveying

FIGURE 6
COMBINED VOLUMES FOR ANALYSIS

WISTERIA HILLS SUBDIVISION
TRAFFIC IMPACT STUDY

Proposed Level-of-Service

Unsignalized intersection capacity analyses were conducted utilizing the combined traffic volumes of FIGURE 6, at the proposed intersection of Yarnell Road and the Wisteria Hills Subdivision access roadway. The results indicate that all traffic movements are expected to operate at level-of-service "A" during both peak hours These results are summarized on the "Two-Way Stop Control Summary" printouts contained in the APPENDIX.

Corner Sight Distance and Other Issues

A field review was conducted to identify any sight distance problems, geometric problems or other issues of concern that could impact the proposed subdivision. The results of this review are summarized below:

1) Corner Sight Distance for Vehicles Exiting the Proposed Subdivision:

Looking left (west) from a STOP position at Yarnell Road, on the proposed subdivision roadway, the sight distance exceeds 400 feet. Looking right (east) from the same STOP position, the sight distance exceeds 400 feet.

Based on Section 62-88 of the Knoxville-Knox County Subdivision Regulations, for a design speed of 40 mph, the required corner sight distance is 400 feet. In the absence of actual design speed information, the design speed is normally assumed to equal the posted speed limit, which in this case is 40 mph. Therefore, in accordance with the field measurements noted above, the available sight distance will exceed the minimum requirement of 400 feet for both approaches, if the intersection is positioned properly. It should be noted that some minor trees and brush exists on the subdivision property looking both directions, and any that affects corner sight distance should be removed prior to opening the subdivision roadways to traffic.

2) Auxiliary Lanes for Proposed Subdivision Intersection:

Left and right turn lane warrant analyses were conducted for the proposed subdivision intersection. These analyses employed Tables 5A and 5B from turn lane warrants developed by Harmelink. The results were that the anticipated traffic volumes are not sufficient to satisfy the minimum warrants. Therefore, auxiliary turn lanes are not warranted. Copies of Tables 5A and 5B are located in the APPENDIX for review.

CONCLUSIONS AND RECOMMENDATIONS

It is the primary conclusion of this study that no significant traffic volume related impacts will result from the development of the Wisteria Hills Subdivision. In fact, capacity analyses of proposed side street (2-way) stop traffic control, indicates that excellent conditions (LOS "A) can be expected during all time periods. In addition, analyses of the need for auxiliary traffic lanes such as left and right turning lanes, indicates that no such lanes will be warranted under the anticipated traffic conditions.

Intersection corner sight distance was also evaluated for the proposed Wisteria Hills Subdivision access roadway intersection with Yarnell Road. Field observations indicated that the proposed intersection is located between two sight limiting vertical hillcrests on Yarnell, one to the east and one to the west. However, it was determined that the intersection can be positioned between the two hillcrests, such that the 400 foot minimum sight distance required for a 40 mph design speed can be achieved (Section 62-88 of the Knoxville Knox County Subdivision Regulations). It is recommended that as a minimum, the subdivision design engineer position the intersection to meet requirements and to equalize the available sight distance in each direction

APPENDIX

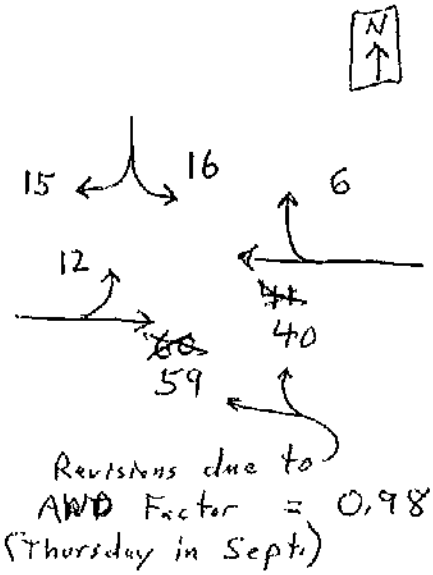
Traffic Count

Yarnell @ Carmichael
By: Keith Carpenter

File Name : untitled2
Site Code : 00000000
Start Date : 09/08/2005
Page No : 1

Groups Printed- Unshifted

	CARMICHAEL From North				YARNELL From East				CARMICHAEL From South				YARNELL From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	4	0	3	0	3	5	0	0	0	0	0	0	0	8	4	0	27
07:15 AM	4	0	0	0	1	11	0	0	0	0	0	0	0	15	2	0	33
07:30 AM	6	0	7	0	0	11	1	0	0	0	0	0	0	20	5	0	50
07:45 AM	2	0	5	0	2	8	0	0	0	0	0	0	0	16	3	0	36
Total	16	0	15	0	6	35	1	0	0	0	0	0	0	61	14	0	148
08:00 AM	3	0	4	0	3	11	0	0	0	0	0	0	0	7	2	0	30
08:15 AM	2	0	2	0	1	12	0	0	0	0	0	0	0	13	2	0	32
Grand Total	21	0	21	0	10	58	1	0	0	0	0	0	0	81	18	0	210
Apprch %	50.0	0.0	50.0	0.0	14.5	84.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0	81.8	18.2	0.0	
Total %	10.0	0.0	10.0	0.0	4.8	27.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	38.6	8.6	0.0	



Peak Hour
7:15 - 8:15 am

Revisions due to
AWD Factor = 0.98
(Thursday in Sept.)

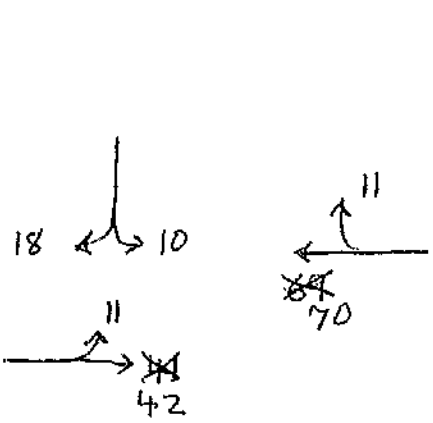
Traffic Count

Yarnell @ Carmichael
By: Keith Carpenter

File Name : untitled1
Site Code : 00000000
Start Date : 09/07/2005
Page No : 1

Groups Printed- Unshifted

	CARMICHAEL From North				YARNELL From East				CARMICHAEL From South				YARNELL From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	3	0	2	0	6	12	0	0	0	0	0	0	0	19	2	0	44
04:15 PM	2	0	3	0	3	17	0	0	0	0	0	0	0	6	1	0	32
04:30 PM	6	0	2	0	3	20	0	0	0	0	0	0	0	10	3	0	46
04:45 PM	3	0	3	0	3	16	0	0	0	0	0	0	0	11	2	0	38
Total	16	0	10	0	15	65	0	0	0	0	0	0	0	46	8	0	160
05:00 PM	5	0	2	0	2	16	0	0	0	0	0	1	0	14	5	0	45
05:15 PM	2	0	0	0	5	9	0	0	0	0	0	0	0	12	3	0	31
Grand Total	23	0	12	0	22	90	0	0	0	0	0	1	0	72	16	0	236
Approch %	65.7	0.0	34.3	0.0	19.6	80.4	0.0	0.0	0.0	0.0	0.0	100.0	0.0	81.8	18.2	0.0	
Total %	9.7	0.0	5.1	0.0	9.3	38.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	30.5	6.8	0.0	



Peak Hour
4:15 - 5:15 pm

Revisions due to
AWD Factor = 1.01
(Wednesday in Sept)

TRAFFIC VOLUME ADJUSTMENT FACTORS TO BE USED WITH "TRAFFIC SIGNAL WARRANT ANALYSIS – VOLUME WARRANTS" [1]

Prepared and Distributed by the *Tennessee Transportation Assistance Program*

TABLE A

Month/Day of Week Urban Area Adjustment Factors [2] – Average Day

(Multiply actual count by given factor to obtain estimated average day volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Sunday	1.60	1.49	1.40	1.37	1.34	1.25	1.30	1.32	1.35	1.36	1.37	1.48
Monday	1.04	1.00	0.97	0.94	0.93	0.91	0.92	0.93	0.94	0.98	0.98	1.03
Tuesday	1.00	0.99	0.95	0.94	0.93	0.91	0.91	0.92	0.93	0.94	0.96	0.97
Wednesday	1.01	0.99	0.96	0.92	0.92	0.90	0.91	0.92	0.93	0.94	0.95	0.94
Thursday	0.99	0.97	0.93	0.90	0.89	0.88	0.89	0.90	0.90	0.92	0.93	0.93
Friday	0.91	0.89	0.87	0.85	0.83	0.81	0.84	0.83	0.83	0.86	0.92	0.86
Saturday	1.22	1.15	1.09	1.11	1.10	1.04	1.08	1.07	1.11	1.11	1.16	1.15

TABLE B

Month/Day of Week Urban Area Adjustment Factors [2] – Average Weekday

(Multiply actual count by given factor to obtain estimated average weekday volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Monday	1.13	1.08	1.05	1.02	1.01	0.99	1.00	1.01	1.02	1.06	1.06	1.12
Tuesday	1.08	1.07	1.03	1.02	1.01	0.99	0.98	1.00	1.01	1.02	1.04	1.05
Wednesday	1.09	1.07	1.03	1.00	1.00	0.98	0.99	1.00	1.01	1.02	1.03	1.02
Thursday	1.07	1.05	1.01	0.98	0.96	0.95	0.96	0.98	0.99	1.00	1.01	1.01
Friday	0.99	0.96	0.94	0.92	0.90	0.88	0.91	0.90	0.90	0.93	1.00	0.93

TABLE C

Month/Day of Week Urban Area Adjustment Factors [2] – Average Friday

(Multiply actual count by given factor to obtain estimated average Friday volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Monday	1.21	1.17	1.13	1.10	1.09	1.06	1.07	1.09	1.10	1.14	1.14	1.20
Tuesday	1.17	1.16	1.11	1.10	1.09	1.06	1.06	1.07	1.09	1.10	1.12	1.13
Wednesday	1.18	1.16	1.11	1.07	1.07	1.05	1.06	1.07	1.09	1.10	1.11	1.10
Thursday	1.16	1.13	1.09	1.05	1.04	1.03	1.04	1.05	1.05	1.07	1.09	1.09
Friday	1.06	1.04	1.02	0.99	0.97	0.95	0.98	0.97	0.97	1.00	1.07	1.00

Notes: 1. "Traffic Signal Warrant Analysis – Volume Warrants" is a Lotus® 1–2–3® template distributed by the *Tennessee Transportation Assistance Program (TTAP).*

2. Factors should be applied to State highway and major street volumes only. They should not be applied to volumes on driveways (shopping centers, etc.) or minor streets.

3. Counts made on holidays should not be used as a basis for estimating average day, average weekday or average Friday volumes.

Source: TABLE A – Tennessee Department of Transportation (based on 1988 through 1992 data)
TABLEs B & C – Developed by T. Daisy Sullivan, P.E. based on TABLE A data

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: ALC
Agency/Co.: Cannon & Cannon, Inc.
Date Performed: 9/8/2005
Analysis Time Period: AM Peak
Intersection: Yarnell / Wisteria Hills Subd.
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2008
Project ID: Full Build-out of Subdivision
East/West Street: Yarnell Road
North/South Street: Wisteria Hills Subdivision
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		85	10	10	66	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		94	11	11	73	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	28		28			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	31		31			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		62				
C(m) (vph)		1480		861				
v/c		0.01		0.07				
95% queue length		0.02		0.23				
Control Delay		7.5		9.5				
LOS		A		A				
Approach Delay				9.5				
Approach LOS				A				

HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: ALC
Agency/Co.: Cannon & Cannon, Inc.
Date Performed: 9/8/2005
Analysis Time Period: PM Peak
Intersection: Yarnell / Wisteria Hills Subd.
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2008
Project ID: Full Build-out of Subdivision
East/West Street: Yarnell Road
North/South Street: Wisteria Hills Subdivision
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		63	32	32	105	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		70	35	35	116	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	19		19			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	21		21			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		42				
C(m) (vph)		1480		810				
v/c		0.02		0.05				
95% queue length		0.07		0.16				
Control Delay		7.5		9.7				
LOS		A		A				
Approach Delay				9.7				
Approach LOS				A				

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

L.T. requirement for both AM & PM peak hours - Not Met!!

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	* 250 *	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
250 - 299	50	45	35	30	30	30
300 - 349	45	40	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

* Or through volume only if a right-turn lane exists

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

R.T. requirement for both AM & PM peak hours - Not Met!!

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99	* *					
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.